The Quadratic Formula **Date:** _____

When a quadratic equation of the form $ax^2 + bx + c = 0$ cannot be factored, we can solve for the roots by using the "Quadratic Formula".

Deriving the Formula using "Completing the Square".

$ax^2 + bx + c = 0$

Result: **To solve a quadratic equation of the form $ax^2 + bx + c = 0$, use the quadratic formula $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$**

EX: **Solve using the quadratic formula:**

A. $6x^2 - 7x + 2 = 0$ **B.** $4x^2 - 12x + 9 = 0$

EX: a) State the vertex and the direction of opening for $y = (x - 4)^2 + 1$.

b) Determine the number of x-intercepts the above relation.

c) Verify the number of x-intercepts by using the quadratic formula.

EX: In a volleyball match the height of the ball in flight can be estimated using the equation $h = -4.9t^2 + 14t + 2.5$ where h is the height, in metres and t is the time, in seconds when Chloe serves the ball. If a player on the other team contacts the ball at a height of 0.5m above the ground, how long does it take for the ball to reach her?

RECALL: The roots of $ax^2 + bx + c = 0$ are also the x-intercepts of the quadratic function $y = ax^2 + bx + c$ so to find the x value of the vertex we can find the midpoint of the roots.

Thus : $$x = \frac{\frac{-b + \sqrt{b^2 - 4ac}}{2a} + \frac{-b - \sqrt{b^2 - 4ac}}{2a}}{2}$$

RESULT: **The x value of the vertex of** $y = ax^2 + bx + c$ **can be found using**

$$x = \frac{-b}{2a}$$

EX: **Find the x-intercepts, the vertex, and the equation of the axis of symmetry for** $y = 3x^2 + 4x - 2$ **.**